Using Revealed and Stated Preference Data to Estimate the Demand and Consumption Benefits of Sporting Events: An Application to the NHL[1]

John C. Whitehead[2], Appalachian State University

Bruce K. Johnson, Centre College

Daniel S. Mason and Gordon J. Walker, University of Alberta

November 4, 2008

Abstract: This paper examines the implications for demand for hockey tickets among residents of Edmonton, Calgary, and the Province of Alberta. Using data on both revealed and stated preferences from a telephone survey conducted throughout Alberta, we estimate the effect of ticket prices, team quality, arena amenities, and capacity on the latent demand for NHL hockey. We also include travel costs in the estimation of the demand function. We find that lower ticket prices, higher team quality and additional capacity encourage attendance. Travel costs are most important in the participation decision relative to the intensity decision.

---

[1] Preparation of this manuscript was supported by a grant from the Alberta Gaming Research Institute. The authors would like to thank the University of Alberta Population Research Lab staff for their assistance collecting the data. A previous version of this paper was presented at the University of Kentucky. The authors thank participants in that workshop, especially Glenn Blomquist, for a number of comments and suggestions.

[2] Corresponding author: Department of Economics, Appalachian State University, Boone, NC 28607; whiteheadjc@appstate.edu.

Introduction

When the Baltimore Orioles moved from their 1950-vintage home in Memorial Stadium to Oriole Park at Camden Yards in 1992, a new era in stadium and arena construction dawned in North American professional sports. The greatly enhanced premium seating, luxury suites, concessions, sight lines, and other amenities made possible by advances in architectural design and construction technology led to large increases in revenues for the Orioles, and teams in Major League Baseball, the National Football League, the National Basketball Association and the National Hockey League joined the rush to replace their now economically obsolete arenas and stadiums with their own version of Camden Yards. Of the 30 National Hockey League (NHL) teams, 24 have moved into new arenas since 1993, with another arena under construction and several under consideration.

Two teams that have not gotten new arenas are the Edmonton Oilers and the Calgary Flames, Alberta's two teams in the NHL. The Oilers continue to play in Rexall Place in suburban Edmonton, which opened in 1974. The Flames play in the Pengrowth Saddledome, dating from 1983. Both teams complain of a lack of space for luxury suites and other premium seating, as well as cramped facilities for concessions, placing them at a competitive disadvantage with other teams in the league (Kom, 2008; Mah, 2007).

Both the Oilers and the Flames have expressed a desire for new arenas, and conversations in Edmonton and Calgary are ongoing as of this writing as to where the new arenas would be sited and to what extent they would be publicly financed. This paper takes the opportunity presented by the possibility of new NHL arenas in Alberta to examine the implications for demand for hockey tickets among residents of Edmonton, Calgary, and the province at large. Using data on both revealed and stated preferences from a telephone survey conducted throughout Alberta, we estimate the effect of ticket prices, team quality, arena amenities, and capacity on the latent demand for NHL hockey, filling several important gaps in the sports economic literature. Unlike most attendance studies, this paper is able to measure private consumption benefits of new arenas, in the form of consumer surplus, to game attendees. Furthermore, unlike the one previous study that econometrically estimated consumer surplus for game attendance (Irani, 1997), this paper includes data on travel costs in the estimation of the demand function, potentially increasing the efficiency of the parameter estimates and therefore of the consumer surplus estimates.

Literature Review

Economists have conducted many empirical analyses of the demand for attendance at sporting contests. Two studies in particular are relevant to this paper because they have addressed the impact of new stadiums and arenas on season attendance. They confirm that the Orioles' experience with increased attendance and revenues was not a fluke. Zygmont and Leadley (2005) use a panel data set of season attendance spanning 1970-2000 in Major League Baseball to estimate the "honeymoon effects" of a new stadium on attendance and ticket prices, finding substantial positive effects on both that persist, with only modest declines, for 8 to 10 years. They conclude that a baseball-only stadium that replaces an older multipurpose stadium will generate an additional $228 million in ticket revenue over 15 years.

Leadley and Zygmont (2006) test for honeymoon effects in the NHL from 1970-2003 using Tobit analysis since the capacity constraint is usually binding in the NHL, unlike in MLB. For instance, during the 2007-08 season, eleven NHL teams achieved season attendance greater than or equal to 100 percent of seating capacity while the league as a whole filled 94 percent of its seats for the season. In MLB in 2007, only eight teams exceeded 90 percent, with one team at 100 percent capacity. The honeymoon effect in the NHL from 1994-2003, a period in which 21 new arenas opened, increased an NHL team's attendance by 15-20 percent and the honeymoon lasted eight years.

There have been many other attendance studies, most of them focusing on game-by-game attendance rather than season attendance. Baseball attendance has been studied more often than attendance in other sports, in part perhaps because capacity constraints are much less likely to be binding in baseball than in other sports. Among the many baseball articles are Bruggink and Eaton (1996), Kahane and Shmanske (1997), Butler (2002), Coates and Harrison (2005), and Donihue, Findlay, and Newberry (2007). Welki and Zlatopper (1994, 1999) estimated game-day attendance in the National Football League, while Price and Sen (2003) did so for Division I-A (now called the Football Bowl Subdivision) college football. Soccer attendance in European leagues has been the subject of studies by Garcia and Rodriguez (2002) and Czarnitzki and Stadtmann (2002), among others. Attendance at National Basketball Association (NBA) games has been estimated by Burdekin and Idson (1991), and attendance at NHL games by Paul (2003).

Despite the differences in locations, time periods and sports, the attendance studies have found broadly similar results. Most studies have found that ticket prices have a negative impact on attendance, though not always, and that except for Bruggink and Eaton (1996), demand tends to be inelastic with respect to price. The inelasticity of demand is surprising considering that the local monopolies usually enjoyed by professional sports teams should result in prices in the elastic portion of the demand. Many studies have also found that income affects demand, with sports more often than not being a normal good. However, in some cases, as in baseball (Bruggink and Eaton, 1996), a sport appears to be an inferior good, even as the same sport appears to be a normal good in other studies. Quality of competition consistently proves significant: the better the home team and its opponent, the higher the attendance.

Irani (1997) estimates a demand function for Major League Baseball using actual 1985 season attendance, as opposed to the usual game-by-game attendance, and ticket price data. Using his estimates to calculate the choke price for MLB tickets and integrating the estimated attendance function over the range of ticket prices, he calculates average annual consumer surplus of about $18 million per team (Irani, 1997).

Alexander, Kern, and Neill (1999) calculate consumer surplus by assuming a constant elasticity demand function, and combining evidence of team revenues with assumptions about different demand elasticities. Not surprisingly, the amount of consumer surplus depends strongly on the value of the assumed elasticity. Alexander et al. do not actually estimate any demand functions or price elasticities.

Methods developed by environmental economists to measure the value of public and private benefits of consumption provide the means to improve upon the estimates of sports consumer surplus developed by Irani and Alexander et al. The travel cost method is a revealed preference method that is most often used to estimate recreation benefits (Smith and Phaneuf 2005), but it has also been used to estimate the benefits of health care (Clarke 2002). The travel and time costs incurred to get to an activity site can constitute a major cost of participating in the activity. Since individuals reside at varying distances from the destinations, the variation in distance and the number of trips taken can be used to estimate a demand function and derive the benefits of activities and activity characteristics. Since sporting events are located at specific sites, and ticket holders often travel great distances to the sites, travel costs could be a significant component of the total cost of the game experience.

Stated preference methods can also be used to estimate the benefits of sporting events and amenities. Stated preference approaches include the contingent valuation method (CVM) and the contingent behavior method (CBM). The CVM uses willingness to pay responses to hypothetical situations to estimate benefits. Over the past decade or so, economists have extended the use of CVM to sports in order to estimate the use and nonuse values of sports public goods. In the seminal CVM sports article, Johnson and Whitehead (2000) surveyed respondents in Lexington, Kentucky who were asked whether and how much they would be willing to pay for a new basketball arena for the University of Kentucky and for a baseball stadium to attract a minor league team. For both projects, the nonmarket benefits fell far short of the costs of constructing the new buildings.

Since Johnson and Whitehead (2000) there have been a number of CVM studies of sports public goods. Civic unity, community pride, improved racial relations, and topics of conversation are some of the public goods addressed by sports CVM studies covering NFL football, NBA basketball, MLB baseball, amateur participatory sports, and the Olympics. For a summary and overview see Johnson (2008). Although the later CVM studies tend to find substantially larger values of sports public goods than did

Johnson and Whitehead in Lexington, Kentucky, peer reviewed sports CVM articles find in every case that the value of sports public goods fall short of the cost of constructing arenas, stadiums, and other venues.

In contrast to the CVM, a stated preference method which asks about willingness to pay in hypothetical situations, the contingent behavior method is a stated preference approach that directly elicits hypothetical behavior information from survey respondents. A hypothetical question is presented that confronts respondents with a choice about a proposed hypothetical change. One strength of the CBM approach is its flexibility. Hypothetical choices may be the only way to gain policy-relevant information about situations where revealed preference data are not available. The major weakness of the CBM approach is its hypothetical nature. Respondents are placed in unfamiliar situations in which complete information is not available. The strengths of the revealed preference approaches are the weaknesses of the stated preference approaches. To date, the CBM has not been applied to sports attendance behavior.

The combination and joint estimation of revealed and stated preference data exploits the contrasting strengths of the alternative approaches while minimizing their weaknesses (Whitehead et al. forthcoming). Revealed preference data can be enhanced by stated preference data. Stated preference data allow analysis of behavior beyond the range of historical experience. In many cases, hypothetical choices may not reflect budget, and other, constraints on behavior. For example, in a contingent behavior survey respondents may answer a hypothetical game trip question with their good intentions of buying season tickets and going to every game. Yet, when they must make real choices, they confront unexpected constraints and make fewer game trips. Combining revealed preference and stated preference data allows mitigation of the bias associated with hypothetical choices present in stated preference data.

There is some evidence that the CBM can be used to accurately forecast changes in behavior. Grijalva et al. (2002) survey rock climbers about their past trip behavior and hypothetical behavior under future access conditions. Following the actual closure of rock climbing areas, respondents are surveyed again to determine if their hypothetical choices are able to predict their actual behavior with the altered conditions. Whitehead (2005) surveys respondents about their past hurricane evacuation behavior after low-intensity storms and hypothetical behavior with low-intensity and high-intensity storms. Two hurricanes followed the survey and respondents are surveyed again to determine their actual evacuation behavior. Both studies find evidence that jointly estimated revealed and stated preference models generate valid predictions of future behavior.

In contrast to previous research valuing sports-related goods and services that rely solely on revealed preference data (Alexander, Kern and Neill 2000) or the CVM (Johnson 2008), we jointly estimate a demand model using revealed and stated preference data. In the rest of the paper we summarize the survey data, describe the empirical methods and present the empirical results. Conclusions and policy implications follow.

Survey Data

A telephone survey conducted during late 2007 and early 2008 collected revealed preference (RP) and stated preference (SP) data. A random sample frame of telephone numbers for the Edmonton and Calgary metropolitan areas and for the rest of Alberta was generated. The initial screening questions selected either a male or female potential respondent age 18 years or older. Based on pre-established quotas data were collected from 937 people (Edmonton, *n* = 339; Calgary, *n* = 331; other Alberta, *n* = 267). In order to meet the quota requirements, 6,764 telephone numbers were called, with 1,610 of these numbers being excluded for technical reasons (e.g., not in service, busy/no answer), and another 2,346 numbers being excluded for non-eligibility and other reasons (e.g., business fax, less than 18 years of age, unable to speak English). Another 1,871 people refused to participate, resulting in an overall response rate of 33 percent (i.e., 937 / [937 + 1,871]).

The study instrument consisted of a Computer-Assisted Telephone Interviewing questionnaire that included the screening items described above as well as contingent valuation method questions, contingent behavior questions and socio-demographic questions. Minor refinements to the instrument were made after it was pre-tested on a sample of 60.

The RP data are based on hockey game trips that actually occurred during the 2006-07 season. The SP data are based on future hockey game trips under various hypothetical conditions. The SP data are used to simulate a change in demand resulting from changes in the quality of the hockey game experience, increased seating availability and changes in ticket prices (see appendix). SP questions asked about future trips to the current arena: (1) with an expected first place finish, (2) with an expected last place finish and (3) with an expected third place finish. SP questions were then asked about future trips to a new downtown arena with additional upper level seating and a third place finish: (1) with a $15 ticket price decrease from the lowest walk up ticket price, (2) with a

$25 ticket price decrease from the lowest walk up ticket price, and (3) with a $5 ticket price decrease from the lowest walk up ticket price. The combined RP-SP data has seven observations for each respondent.

Respondents in the Edmonton and Calgary surveys were asked questions about Oilers and Flames games, respectively. Respondents in the Alberta rural survey were asked "About how often do you visit Calgary?" and "About how often do you visit Edmonton?" Respondents who visit Calgary more often were considered in the Flames market and asked questions about trips to Flames games. Respondents who visit Edmonton more often were considered to be in the Oilers market and asked questions about trips to Oilers games. Respondents were also asked "How long does it usually take you to get to Calgary/Edmonton?" The average number of hours traveled is 4 to Calgary and 3 to Edmonton. Seventy-two percent of rural Alberta respondents visit the city with the lowest travel time more often. Hours traveled is converted to distance traveled assuming an average speed of 75 kilometres per hour.

In a previous section of the survey respondents are described a new downtown hockey arena with various features (Johnson et al. 2008):

> *Suppose the Flames/Oilers decide to build a new, state-of-the-art hockey arena [in a complex that would also include affordable housing, arts and cultural space including galleries, theatres and museum space, and a casino] in downtown Calgary/Edmonton to replace the Pengrowth Saddledome/Rexall Place. [Suppose environmentally friendly materials and design will be used]. Some people say that building the arena, [housing, cultural complex, and casino] downtown would*

improve the quality of life in Calgary/Edmonton more than building it in the suburbs.

Respondents in the Edmonton and Calgary surveys received various combinations of arena characteristics ranging from a new arena with no additional characteristics and an arena with four additional characteristics (green design, affordable housing, cultural complex and a casino).

Of the 937 completed interviews with Edmonton and Calgary metropolitan respondents and respondents in the rest of Alberta, we discard cases based on item nonresponse to the SP attendance and other key questions. We employ a sample of 828 respondents. In Table 1 we present a summary of the game trip dependent variable. Based on preliminary analyses that showed the hockey trip demand functions differed by team market and by whether the respondent had attended a game during the past season, we present the data in terms of four subsamples: (1) Flames market respondents who attended a game (n=133); (2) Flames market respondents who had not attended a game (n=246); (3) Oilers market respondents who attended a game (n=148); and (4) Oilers market respondents who had not attended a game (n=301). Those in the Flames market who had attended at least one game attended an average of 5 games during the past season. Those in the Oilers market who had attended at least one game attended an average of 4 games during the past season. National Hockey League teams host 41 regular season games each season.

In each subsample we find a similar pattern of results across scenarios. Under the current arena and price scenario, respondents were more likely to state they would attend games regardless of the team's expected finish. Those in the Flames market who had attended at least one game said they would attend an average of 7, 6 and 6 games during the future season with an expected team finish of first, fifth and third. Those in the Oilers market who had attended at least one game said they would attend an average of 6, 5 and 5 games during the future season with an expected team finish of first, fifth and third. Those in the Flames and Oilers markets who had not attended at least one game said they would attend between zero and one games during the future season with an expected team finish of first, fifth and third.

With a new arena and lower ticket prices, respondents who had attended a game during the past season said that their future attendance would roughly double. Those in the Flames market would attend an average of 10, 13 and 9 games during the future season with upper level ticket prices of $20, $10 and $30. [3] Those in the Oilers market said they would attend an average of 8, 9 and 6 games during the future season with upper level ticket prices of $30, $20 and $40.

---

[3] This issue is complicated when you consider that many of the seats in the upper deck at the Saddledome have obstructed views. This helps to explain why the cheapest ticket price in Calgary is so much lower than in Edmonton. It also might influence buying preferences, as some fans might not even consider going to games at the current Saddledome because of poor sightlines, but would with a new one (with clear viewing). Thus even though there might not be any more seats in a new building, it might be seen as an increase in capacity for some fans who want seats with a good view of the game.

With a new arena and lower ticket prices, respondents who had not attended a game during the past season said that their future attendance would also increase significantly. Those in the Flames market would attend an average of 2, 3 and 1 games during the future season with upper level ticket prices of $20, $10 and $30. Those in the Oilers market said they would attend an average of 1, 2 and 1 games during the future season with upper level ticket prices of $30, $20 and $40.

Table 2 presents descriptive statistics for the independent variables. The actual ticket price paid by Flames and Oilers game attendees is $82 and $78, respectively. Average ticket prices paid for Flames and Oilers games range from $11 to $300 and $20 to $179. The range of prices is beyond the range of the face value of the tickets indicating that the reported price paid includes secondary market purchases.

Several differences across subsamples emerge. The average travel cost is $26 and $40 for Flames and Oilers attendees and $44 and $66 for non-attendees indicating that travel distance is a factor in the game trip decision.[4] The average household income is $110 thousand and $77 thousand for Flames attendees and non-attendees.[5] Average

---

[4] Travel cost is computed as $c = \alpha d + (\theta y / h)(d / mph)$, where α is the average cost per mile, d is round-trip distance, θ is the opportunity cost of time, $0 < \theta < 1$, y is household income, h is annual work hours, and mph is average miles per hour. We use the following values: $\alpha = 0.32$, $\theta = 0.33$, $h = 2000$ and $mph = 75$ k/h.

[5] Sixteen percent of the income variables are imputed using an income regression that has an R^2 value of .27. In this model income increases with education and age (at a

household income is $94 thousand and $71 thousand for Oilers attendees and non-attendees. This comparison suggests that respondent ability to pay may be a factor in the game trip decision.

In both markets respondents are more likely to attend games if male. Sixty-three percent of attendees are males in the Calgary market and 59 percent are males in the Edmonton market. Non-attendees are 43 percent male and 39 percent male in the Calgary and Edmonton markets. Game attendees are younger, an average of 43 years old in both markets, relative to non-attendees who are 50 and 52 years old in the Calgary and Edmonton markets.

Perhaps because the Pengrowth Saddledome is near downtown Calgary while Rexall Place is in the suburbs, a higher proportion of Flames attendees live and work downtown than do Oilers attendees. This is further evidence that travel costs may affect attendance decisions. Among Flames and Oilers attendees, 8 percent and 2 percent live downtown, 25 percent and 13 percent work downtown, and 69 percent and 56 percent own property in the metro area. Among Flames and Oilers non-attendees, respectively, 6 percent and 5 percent live downtown, 11 percent and 11 percent work downtown, and 50 percent and 48 percent own property in the metro area. Fourteen percent of Flames attendees and 25 percent of Oilers attendees are from the Alberta survey. Thirty percent and 35 percent of non-attendees of Flames and Oilers games are from the Alberta survey.

---

diminishing rate). Income is higher for males, married respondents, and metro respondents (relative to rural Albertans).

Other variables show little difference across subsamples. Between 65 percent and 73 percent of each subsample are married. The average number of years of schooling is 14. The average number of years lived in the city is between 17 and 21.

Empirical Model

The Poisson regression model is often used to study count data such as numbers of activity trips (Haab and McConnell, 2003). Assume that x_{it} is the number of hockey game trips taken by individual *i* in scenario *t*, which is drawn from a Poisson distribution with mean λ_{it}:

$$\Pr(x_{it}) = \frac{e^{-\lambda_{it}} \lambda_{it}^{x_{it}}}{x_{it}!}, x_{it} = 0,1,2,... \tag{1}$$

The natural log of the mean number of game trips is assumed to be a linear function of prices, income and scenario dummy variables. To allow for variation across hockey fans that cannot be explained by the independent variables, we assume that the mean number of trips also depends on individual specific and random error. The RP-SP Poisson demand model is:

$$\ln \lambda_{it} = \beta_0 + \beta_{p^R} p_{it}^R + \beta_p p_{it}^S + \beta_c c_i + \beta_y y_i + \beta_{RP} RP + \delta' Z + \gamma' D + \mu_i + e_{it} \tag{2}$$

where p^R is the revealed preference ticket price (p^R=0 if x = 0), p^S is the stated preference ticket price, c is the round trip travel cost to the hockey arena, y is income, RP is a revealed preference dummy variable; $\beta, \delta,$ and γ are coefficient vectors to be estimated; μ_i is the random effect for group (person) *i* and e_{it} is a mean zero error term. Individuals are indexed $i = 1, \ldots, n$, and $t = 1, \ldots, 7$ denotes seasonal hockey game trip demand under RP and SP scenarios in the pseudo-panel data. Z is a vector of scenario design variables (i.e., new arena, arena characteristics) and D is a vector of demographic characteristics. The *RP* dummy variable is included to test for bias in hypothetical responses: $RP = 1$ for revealed preference trip data (t = 1) and 0 for stated preference trip data (t > 1).[6]

Pooling the data suggests that panel data methods be used to account for differences in variance across sample individuals, i, and scenarios, t. The distribution of trips is Poisson with conditional mean and variance, λ_{it}. If $\exp(\lambda_{it})$ is assumed to follow a gamma distribution, then the unconditional trips, x_{it}, follow a negative binomial distribution (Hausman, Hall, and Griliches 1984).

With the semi-log functional form price, travel cost and income elasticities are $e_p = \beta_p \bar{p}^S, e_c = \beta_c \bar{c}, e_y = \beta_y \bar{y}$. The full price elasticity is the weighted average of the price and travel cost elasticity

[6] If predictions of aggregate attendance were important we would estimate trips with the *RP* dummy variable set equal to one to account for those SP trips under status quo conditions that exceed the RP trips under status quo conditions assuming that the difference in trips represents hypothetical bias, the overstatement of future trip taking behavior. However, since hockey game attendance is typically at capacity in Calgary and Edmonton, this adjustment is not necessary.

$$e_{pc} = e_p \theta_p + e_c \theta_c \tag{3}$$

where $\theta_k = \dfrac{k}{p+c}$, $k = p, c,$ is the ticket price and travel cost share of the full price.

With the semi-log functional form the economic benefit per hockey game for the representative hockey fan as measured by average consumer surplus (*CS*) per game in the ticket market is (Bockstael and Strand 1987):

$$\frac{CS_p}{x} = \frac{1}{-\beta_p}, \tag{4}$$

The economic benefit per hockey game trip is a weighted average of the ticket price and travel cost consumer surplus

$$\frac{CS_{pc}}{x} = \frac{-1}{\beta_p}\theta_p + \frac{-1}{\beta_c}\theta_c \tag{5}$$

The economic benefit of a change in the hockey experience per game measured by the j$^{\text{th}}$ scenario design variable ΔZ_j and evaluated in the ticket market is:

$$\frac{\Delta CS_p(\Delta Z)}{x} = \frac{-\delta_Z \Delta Z}{\beta_p}. \tag{6}$$

where δ_{Z_j} is the regression coefficient on the j$^{\text{th}}$ scenario design variable. The economic benefit of a change in the hockey experience per hockey game trip is a weighted average of the change in ticket price and travel cost consumer surplus

$$\frac{\Delta CS_{pc}(\Delta Z)}{x} = \frac{-\delta_Z \Delta Z}{\beta_p}\theta_p + \frac{-\delta_Z \Delta Z}{\beta_c}\theta_c \tag{7}$$

Equations (5) and (7) diverge from equations (4) and (6) with statistically significant coefficients on the travel cost coefficients. If the travel cost coefficient is statistically insignificant then that term drops out of the consumer surplus equation.

Empirical Results

Table 3 presents the random effects Poisson coefficient estimates for the Calgary Flames and Edmonton Oilers markets. The models include the revealed preference ticket price as an independent variable. However, its expected effect on the number of games attended does not conform to expectations from economic theory since ticket price is differentiated by quality for those who attend games and not measured for those who do not attend games. Economic theory indicates that each dollar of cost should be considered equivalently by consumers, suggesting that ticket price and travel cost should be added together to form a single cost variable. However, model performance is superior with these variables entered separately. This suggests that consumers respond differently to the two types of cost. Speculating, the travel cost variable could be capturing the cost of multi-purpose trips. In addition to a hockey game, respondents could also enjoy shopping or dining in the area. In this case we would expect the travel cost elasticity to be less than the ticket price elasticity.[7]

[7] Yet another possibility is that the opportunity cost of time assumed in the estimation of travel cost is too high. The mass transit literature, for instance, has found that commuters behave as if the opportunity cost of access time, i.e., walking to and from stations and

Each model contains a dummy variable for the new arena scenario and the new arena dummy interacted with the Alberta sample (this is the only variable that indicates different behavior across samples). Team finish and dummy variables for arena features, green design and construction, affordable housing, a casino and a cultural complex are included. Each of the arena features dummy variables is coded as zero for the Alberta sample since respondents who live in Edmonton and Calgary were not asked the arena scenario questions. In addition, dummy variables for the revealed preference scenario, gender and marital status are included. Continuous variables included in the model are household income, age and years of schooling.

In both models the revealed preference coefficient is negative and significant and the actual ticket price coefficient is positive and significantly different from zero. There are two interpretations of the first result. First, it might indicate hypothetical bias. In the hypothetical scenarios respondents said that they would like to attend more games than they are actually able to attend. The second interpretation is that this result measures latent demand at the current seating capacity and ticket prices. Respondents would like to attend more games but game sell-outs constrain their attendance behavior. The RP-Price

---

waiting for the bus or train, is as much as three times the opportunity cost of line-haul time, or time spent in the vehicle. In general, the opportunity cost of commuting time is less than the wage rate. The literature also indicates that the elasticity of travel demand with respect to time is greater for non-commuting trips than for commuting trips. Our estimate of travel cost elasticity—admittedly not the same thing as travel time elasticity—is only about one-fourth line-haul elasticity and one-seventh of the access time elasticity.

coefficient is positive because only those who attend games have a positive observed ticket price variable.

In each model the coefficient on the stated preference price variable is negative and statistically significant. Demand is inelastic in the Calgary market, $e_p = -0.72$, and unitary elastic in the Edmonton market, $e_p = -1.03$. The coefficient on the travel cost variable is negative and statistically significant in the Calgary market and the elasticity is $e_c = -0.17$ in the Calgary market. The full price elasticity in the Calgary market is $e_{pc} = -0.53$.[8] The coefficient on the income variable is positive and statistically significant in the Calgary model. The income elasticity is $e_y = 0.76$.

In each model, a new downtown arena with plenty of upper level seats would increase attendance, especially for rural Canadians as the NEWARENA and NEWARENA × ALBERTA coefficients are positive and statistically significant. According to the marginal effects, Flames fans that live in Calgary would go to one additional game each year. Flames fans that live in Alberta would go to almost two additional games each year. According to the marginal effects, about 13 percent of Oilers fans would attend one more game each year. Rural Albertans in the Oilers market would attend about one additional game each year.

In each model, an improvement in the standings would increase attendance. According to the marginal effects, 22 percent and 17 percent of Flames and Oilers fans would go to one additional game with a one unit improvement in the standings. Additional arena attractions have limited appeal. Seventy-four percent of those in the Oilers market would go to one additional game each year if the new downtown arena

[8] The market price and travel cost weights are 0.68 and 0.32 respectively.

contained a casino, but other arena attractions were insignificant. In terms of demographic variables, older respondents attend fewer games in both markets. For Oilers fans, males attend more games and married respondents attend fewer games.

We next split each market into those who had revealed a preference for hockey games during the 2006-07 season (attendees) and those who had not (non-attendees). The random effects Poisson coefficient estimates for each market and attendees and non-attendees subsamples are presented in Table 4. In each of the attendee models, the revealed preference coefficient is negative and significant and the actual ticket price coefficient is not significantly different from zero. The effect of revealed preference ticket price on the number of games attended is ambiguous since current game trips are quantity constrained and ticket price is partially endogenous as an increasing function of income.

In each attendee model the coefficient on the stated preference price variable is negative and statistically significant. Demand is inelastic across markets: $e_p = -0.57$ for Calgary and $e_p = -0.77$ for Edmonton. The coefficient on the travel cost variable is negative and statistically significant in the Calgary attendee model. The travel cost elasticity is $e_c = -0.10$ for Calgary. The full price elasticity is $e_{pc} = -0.45$ in the Calgary attendee model.[9] The coefficient on the income variable is positive and statistically significant in the Edmonton attendee model. The income elasticity is $e_y = 0.78$.

In each non-attendee model the coefficient on the stated preference price variable is negative and statistically significant. Demand is elastic: $e_p = -1.25$ for Calgary and

[9] The market price and travel cost weights are 0.75 and 0.25 respectively.

$e_p = -1.78$ for Edmonton. The coefficient on the travel cost and income variables is statistically insignificant in each non-attendee model.

In each model, a new downtown arena with plenty of upper level seats would increase attendance in three of the four models, especially for rural Canadians in three of the four models, as the NEWARENA and NEWARENA × ALBERTA coefficients are positive and statistically significant. According to the marginal effects, Flames attendees and non-attendees would go to two more games each year. Fifty-six percent of Oilers non-attendees would attend one more game each year. Rural Albertans in the Flames market that already attend games would attend an additional three games in addition to the two suggested by the NEWARENA coefficient each year. Rural Albertans in the Oilers market that already attend games would also attend an additional three games each year in a new downtown arena.

In each model, an improvement in the standings would increase attendance. According to the marginal effects, 47 percent and 21 percent of Flames attendees and non-attendees would go to one additional game with a one-place improvement in standings; as would 26 percent and 30 percent of Oilers attendees and non-attendees. Flames attendees would go to five fewer games each year if the new arena also included a cultural complex. Oilers non-attendees would go to one additional game if the new arena contained a casino. No other arena design features affect attendance. In terms of demographic variables, older respondents attend fewer games. For Oilers attendees, males attend two more games, married respondents attend almost three fewer games and each two years of schooling reduces attendance by one game.

Consumer Surplus

We use the demand models from Table 4 and present consumer surplus estimates in Table 5. The base case consumer surplus per game is $50 for both the Flames and Oilers attendees and $23 and $22 for Flames and Oilers non-attendees. That attendee consumer surplus exceeds that for non-attendees makes theoretical sense as the willingness and ability of non-attendees to pay for a game is lower according to the revealed preference of non-attendance.

Note that all four of the base case consumer surplus values are obtained from the stated preference price coefficient only, which leads to two caveats. First, since the stated preference prices are lower than what most attendees paid for their tickets, actual consumer surplus for attendees might be greater than or less than $50. We use the demand slope based on the variation in stated preference prices with a new arena to extrapolate the demand curve to the choke price. To the extent that this extrapolation is inaccurate, our consumer surplus results are inaccurate.

Second, consumer surplus per game is an underestimate of the total value of the game trip for all consumers. The full value of the game trip is the consumer surplus of a game trip considering both ticket prices and travel costs. The only statistically significant coefficient for travel cost is for game attendees in the Flames market. The full price consumer surplus per game trip, $103, is weighted by the dollar shares of the different costs. However, interpretation of the full price consumer surplus per game trip is complicated by the possibility of multi-purpose trips. Since the travel cost coefficient is statistically insignificant in the other three models we do not further discuss its effect on the value of game trips until the conclusions, except to note that consumer surplus per game estimates do not include these values.

Under the latent demand interpretation of the revealed preference dummy variable – indicating that respondents would attend more games if seats were available – the consumer surplus for attendees is $9 and $11 for each additional Flames and Oilers game with the current arena and ticket prices, assuming the respondent could obtain a ticket. This result makes intuitive sense as additional games are subject to diminishing returns and should be expected to generate lower value.

The consumer surplus value of each additional game in a new downtown arena is $12 and $45 for Flames attendees and non-attendees residing in Calgary, and $0 and $16 for Oilers attendees and non-attendees living in Edmonton. In the non-metropolitan areas the consumer surplus value of each additional game in a new downtown arena is $29 and $36 for Flames attendees and non-attendees, and $21 and $30 for Oilers attendees and non-attendees. This result should be interpreted as evidence of a quality shift of demand. For attendees, the consumer surplus of additional games should be compared with the consumer surplus per game in the current arena. For non-attendees, the additional consumer surplus of additional games should be compared with the base case consumer surplus per game. The quality factor can be interpreted either as an increase in perceived value of games in a new arena with additional amenities or, in the case of Edmonton, that the downtown location is preferred due to more convenience or proximity to additional downtown amenities.

Each additional place in the standings is worth $3 and $6 in additional consumer surplus per game to Flames attendees and non-attendees, and $2 and $8 to Oilers attendees and non-attendees. This is evidence that demand increases with the quality of teams relative to others in the same division. Adding a cultural complex to a new arena in

Calgary would reduce consumer surplus per game by $31 for Flames attendees. Adding a casino to a new downtown arena would increase consumer surplus by $30 per game for current Oilers non-attendees.

Combining the marginal effects estimates with the consumer surplus per game estimates provides estimates of the change in consumer surplus per season. Considering the base case and not considering the additional travel costs or higher ticket prices, Flames fans who attend an average of 5 games enjoy consumer surplus of $261 over the course of the season. Oilers fans who attend an average of 4 games enjoy consumer surplus of $193 over the course of the season. Flames and Oilers fans who attend games would enjoy an additional $13 and $14 over the course of the season, respectively, if seats were always available.

With a new arena Flames attendees and non-attendees and Oilers non-attendees in the metropolitan area would enjoy an additional $23, $75 and $9 in consumer surplus over the course of the season. Similarly, with a new arena Flames attendees and non-attendees, and Oilers attendees and non-attendees in the non-metropolitan areas of Alberta would enjoy an additional $136, $48, $56 and $32 in consumer surplus over the course of the season. Since the impact on consumer surplus of a rise in the standings affects all games attended, not only the increase in games, the seasonal effect on consumer surplus is the product of the change in consumer surplus per trip and the sum of baseline trips and the marginal effect of a change in the standings. Flames attendees and non-attendees would enjoy $14 and $27 in additional consumer surplus during the season, while Oilers attendees and non-attendees would get an additional $11 and $41. Assuming the value of games attended with a new arena is also affected, the cost of a cultural complex to Flames attendees is $53 in lost consumer surplus over the course of the season. The benefit of a casino to current Oilers non-attendees is $46 in additional consumer surplus over the course of the season.

Conclusions

This paper is the first to estimate ticket demand functions for individual sports fans using individual level microdata. Because capacity constraints are often binding in the NHL, estimation of individual hockey demand functions using revealed preference data alone would be difficult, even if individual level microdata were available. The results show, in the case of Calgary, that hockey fans who already attend games would buy one-third more tickets per year if seats were available at lower prices. The results also show that fans are sensitive to team quality, and that each rung a team climbs in its divisional standings will increase ticket demand by half a ticket per year in Calgary and one-quarter ticket per year in Edmonton. We find little evidence that additional arena attractions would increase game demand, though these additional features may attract non-hockey fans.

We also include travel costs as an additional variable to explain demand behavior. In the Calgary model that includes attendees and non-attendees travel cost is a significant determinant of game attendance. Specifically, travel costs are important in the participation decision, i.e., whether to attend zero or a positive number of games. When we split the samples into attendees and non-attendees we find in that in only one of the four subsamples that respondents who face higher travel costs would attend fewer games. The benefits that accrue to Calgary Flames attendees are biased downwards because they are not based on the full price of attendance. Using the full price consumer surplus, current attendees in the Calgary Flames market would enjoy an additional $24 in consumer surplus per game in a new arena, over and above the consumer surplus based on ticket price alone.

The capacity constraints seem to have the largest effect on Albertans living outside the province's two largest metropolitan areas. Their gains in consumer surplus would be large. In this sample, 14 percent of Flames attendees and 25 percent of the Oilers attendees live outside their team's metropolitan areas. Those percentages might increase with a new arena with ample seating since nonmetropolitan residents who do not currently attend games say they would attend a game a year in both Calgary and Edmonton. These results suggest the benefits of new arenas in Calgary and Edmonton would accrue to a large extent to non-metropolitan residents. The teams would no doubt try to capture some of the consumer surplus through price discrimination or two-part tariffs.

Stadium and arena complexes built or proposed in the past decade have increasingly included features and amenities far beyond the actual sports building itself. Petco Field, a baseball stadium in San Diego, and Nationwide Arena, a hockey arena in Columbus, Ohio, are the anchors of development districts including housing, entertainment, and other features. Proponents of stadiums and arenas as tools for urban revitalization tend to argue that sports venues alone cannot succeed in transforming decaying urban districts. They say that other types of development are needed which, together with a stadium or arena, can bring round the clock activity and life to a downtown or other depressed neighborhood (Rosentraub, 2008).

That more arena and stadium developments in North America in recent years have included other components may reflect the need to build broad coalitions among interest groups to gain political support for publicly financed sports venues. Whether large, diversified development projects as tools of urban revitalization are something that taxpayers are willing to pay for is examined by Johnson et al. (2008). In the current study, features such as housing, arts and cultural space, and casinos in arena development projects would have no effect on the demand for hockey tickets in Calgary and Edmonton, with two exceptions. Demand for hockey by Calgarians who already attend games would fall if a new arena complex included arts and cultural space, while demand for Oilers tickets by non-Edmontonians would rise substantially if a casino were built alongside a new arena. That non-sports features mostly have no effect on demand for hockey, and may even decrease the demand for hockey, suggests that increased consumer surplus of hockey fans cannot be considered a benefit of diversity in development projects.

Binding capacity constraints have a large impact on the number of games attended by fans of the Calgary Flames and Edmonton Oilers of the NHL, imposing a large deadweight loss on fans and the teams, especially in Calgary. For instance, Calgary residents who currently attend Flames games would attend about one-third more games per season if capacity allowed and if prices of the cheapest tickets were lower. The season-long consumer surplus for current attenders would increase by 31 percent in Calgary at the prices mentioned in the survey. In Edmonton, in contrast, the increase in consumer surplus is virtually nil, since Edmontonians would not increase their attendance.

That the capacity constraints in Calgary could impose such large welfare costs may seem surprising, but other evidence is consistent with this conclusion. For instance, the average ticket prices in Calgary and Edmonton are the third and fourth highest in the NHL, according to Team Marketing Report, a firm that compiles ticket price data for professional sports teams. The high ticket prices and sold out seasons, along with the fact that Calgary and Edmonton are among the smallest metropolitan areas in the NHL, are evidence of a high per capita demand for hockey tickets, consistent with the survey responses and estimated demand functions in this paper.

These potential gains in consumer surplus may be conservative. New stadiums and arenas incorporate many advances in construction technology and architectural design that result in higher demand for tickets. Better sightlines, more restrooms, restaurants, and concession stands made easily accessible by wide aisles and concourses make for more comfortable environments for spectators. Such improvements mean that, at least in the honeymoon period, fans are willing to buy more tickets at higher prices. The hypothetical scenarios presented in the surveys in Alberta did not mention such amenities. The potential gains to consumer surplus in such an arena would be higher than the gains estimated in this paper.

However, the potential for adding seats in Calgary is limited. The Pengrowth Saddledome's capacity of 19,289 is just 1,984 less than that of the largest arena in the NHL, Montreal's Bell Centre. Even with a new arena, Flames fans may face a binding capacity constraint. The potential increase in capacity is much larger in Edmonton, where current capacity of 16,839 is the second smallest in the NHL. But current attendees say they would not attend more games even if plenty of seats were available at lower prices.

This may be because the proposed new arena would be downtown instead of in the suburbs, making it harder to reach for many spectators. However, travel costs to downtown Edmonton were not a significant variable in the estimated demand function.

The results of the consumer surplus estimation in this paper, based on individual demand functions estimated from both revealed and stated preference data, are broadly consistent with the estimates of consumer surplus from Major League Baseball developed by Irani (1997) based on 1985 season-long aggregate attendance data. Irani's figure of $35 million per team (2007 dollars), is based on an 81-game home schedule in stadiums that are much larger than NHL arenas, which host only 41 games per year. Considering that Calgary and Edmonton game attendees receive consumer surplus of $50 per game, sold out arenas in Calgary and Edmonton generate annual consumption benefits of $40 and $35 million. Considering the full price consumer surplus for the Calgary Flames of $103 per game trip, the annual consumption benefits may be as high as $82 million.

Our results can be used to inform policy makers considering arena subsidies in terms of the efficiency of subsidies: do the consumption benefits of a new arena justify the cost? An average new NHL arena costs between $275 million and $400 million. There are a number of alternative scenarios for the consumption benefits and we consider one. Suppose the new arena reaches the maximum NHL capacity of 21,273 seats and the additional seats are filled with current nonattendees. The per game consumer surplus for additional seats in a new arena is $45 and $16 for those in the Calgary and Edmonton markets who do not currently attend games. Forty-one home sellout games would generate additional annual consumer surplus of $3.6 million and $2.8 million in Calgary and Edmonton. We consider two alternative discount rates: 2 percent and 7 percent. With a 2 (7) percent discount rate and benefits accruing for 30 years, the present value of consumer surplus is $82 ($45) million and $63 ($35) million in Calgary and Edmonton. Therefore, the consumption benefits of new seating for the Flames and Oilers do not appear to justify a new downtown arena.

However, the Calgary Flames generate additional consumption benefits. Current attendees in the Calgary Flames market would enjoy an additional $12 in consumer surplus per game in a new arena. At current arena capacity over 41 home games, the annual benefits are $9.5 million. Discounted at 2 (7) percent in perpetuity, the present value to existing attendees of a new arena is $213 ($118) million. The present value of consumption benefits to existing and new consumers is $295 ($163) when discounted at 2 (7) percent over 30 years.

Ever since the Carolina Panthers of the National Football League pioneered personal seat licenses as a way to finance a new stadium in the mid 1990s, professional sports teams have increasingly employed two-part tariffs and price discrimination schemes to extract consumer surplus from their fans. The Calgary estimates of $949 million for consumer surplus generated by a new arena suggest that the Flames could finance much of the cost of a new arena by extracting additional consumer surplus through personal seat licenses and through price discrimination schemes. Because the benefits would accrue to the fans attending games rather than to the public at large, and because the Flames could devise a mechanism to extract the surplus, it would be difficult to use the existence of the greater surplus to justify a public subsidy. The efficient outcome would appear to be to build the stadium. Two-part tariffs and price discrimination provide a mechanism for financing the efficient outcome without resorting to subsidy.

Appendix: Calgary Telephone Questionnaire (Section C)

The next few questions are about your attendance at Calgary Flames games.

C1. How many Calgary Flames games did you attend during the 2006-07 season?

_____games IF zero, skip to C3.

C2. About how much do you usually pay for your Flames tickets?

________ Dollars

C3. Suppose the Flames are expected to finish first in their division and challenge for the Stanley Cup this season. About how many Flames games would you plan to attend in Calgary this season?

_____ games – if zero, go to C6

C4. Now suppose that the Flames are expected to finish last in their division. About how many Flames games would you plan to attend in Calgary this season?

_____ games

C5. Now suppose that the Flames are expected to finish third in their division and make the playoffs this season. About how many Flames games would you plan to attend in Calgary this season?

_____ games

C6. Suppose that the Flames build a new professional hockey arena [+ casino, affordable housing, cultural complex] in downtown Calgary. The new arena will have additional upper level seating with unobstructed views and luxury suites. For these questions, please assume that your personal situation stays the same. For example, you have the same job, income and family situation. Also assume that the Flames are expected to finish third in their division and make the playoffs. OK?

C7. If other ticket prices don't change at the new arena and there are plenty of additional upper level seats with unobstructed views available at a price of $20 per game, how many Flames games would you plan to attend in the new downtown Calgary arena during the season?

______ games

C8. If the tickets for the additional upper level seats with unobstructed views are available at a price of $10 per game, how many Flames games would you plan to attend in the new downtown Calgary arena during the season?

______ games

C9. If the tickets for the additional upper level seats with unobstructed views are available at a price of $30 per game, how many Flames games would you plan to attend in the new downtown Calgary arena during the season?

______ games

References

Alexander, Donald L., William Kern and Jon Neill. 2000. "Valuing the Consumption Benefits from Professional Sports Franchises," *Journal of Urban Economics* 48:321-337.

Bruggink, Thomas H, and James W. Eaton. 1996. Rebuilding Attendance in Major League Baseball: The Demand for Individual Games in *Baseball Economics: Current Research*, John Fizel, Elizabeth Gustafson, and Lawrence Hadley, eds. Praeger, Westport, CT, pp. 9-31.

Burdekin, Richard C.K. and Todd L. Idson. 1991. Customer Preferences, Attendance and the Racial Structure of Professional basketball Teams. *Applied Economics* 23:179-186.

Butler, Michael R. 2002. Interleague Play and Baseball Attendance. *Journal of Sports Economics*. 3(4):320-334.

Clarke, Philip M. 2002. "Testing the Convergent Validity of the Contingent Valuation and Travel Cost Methods in Valuing the Benefits of Health Care," *Health Economics* 11:117-127.

Coates, Dennis and Thane Harrison. 2005. Baseball Strikes and the Demand for Attendance. *Journal of Sports Economics* 6(3):282-302.

Czarnitzki, D. and G. Stadtmann. 2002. The Uncertainty of Outcome versus Reputation: Empirical Evidence for the First German Football Division. *Empirical*

Economics. 27(1):101-112.

Donihue, Michael R., David W. Findlay, and Peter W. Newberry. 2007. An Analysis of Attendance at Major League Baseball Spring Training Games. *Journal of Sports Economics* 8(1):39-61.

Garcia, J. and P. Rodriguez. 2002. The Determinants of Football Match Attendance Revisitied: Empirical Evidence from the Spanish Football League. *Journal of Sports Economics* 3(1):18-38.

Haab, Timothy C., and Kenneth E. McConnell. 2002. *Valuing Environmental and Natural Resources: The Econometrics of Non-market Valuation*, Northampton, MA: Edward Elgar.

Hausman, J., B.H. Hall, and Zvi Griliches. 1984. Econometric Models for Count Data with an Application to Patents—R&D Relationship. *Econometra* 52:909-938.

Irani, Darius. 1997. Public Subsidies to Stadiums: Do the Costs Outweigh the Benefits? *Public Finance Review* 25:238-253.

Johnson, Bruce K. 2008. "The Valuation of Non-Market Benefits in Sport," Chapter 9 in *The Business of Sports*, Volume 2, edited by Brad R. Humphreys, Dennis R. Howard, Praeger, Westport, CT, pp. 207-233.

Johnson, Bruce K., and John C. Whitehead. 2000. Value of Public Goods From Sports Stadiums: The CVM Approach. *Contemporary Economic Policy* 18(1):48-58.

Johnson, Bruce K., John C. Whitehead, Daniel Mason, and Gordon Walker. 2008. "Willingness to Pay for Downtown National Hockey League Arenas," paper presented at the 2008 Southern Economic Association meetings.

Kahane, Leo and Stephen Shmanske. 1997. Team Roster Turnover and Attendance in Major League Baseball. *Applied Economics* 29:425-431.

Kom, J. (2008, April 6). Dome dreams: As a brash kid, our city's arena welcomed the 1988 Olympics, but the hockey hotshot is now an aging player in the sports world. *Calgary Herald,* p. B1.

Leadley, John C and Zenon X Zygmont. 2006. "When is the Honeymoon Over? National Hockey League Attendance," *Canadian Public Policy*, 32(2):213-232.

Mah, B. (2007, February 22). Plan for an aging Rexall. *Edmonton Journal,* p. A3.

Paul, R. 2003. Variations in NHL Attendance: The Impact of Violence, Scoring, and Regional Rivalries. *American Journal of Economics and Sociology* 62(2):345-364.

Phaneuf, Daniel J., and V. Kerry Smith. 2005. "Recreation Demand Models," Chapter 15 in Handbook of Environmental Economics: Volume 2 *Valuing Environmental Changes*, edited by Karl-Göran Mäler and Jeffrey R. Vincent, Elsevier North-Holland.

Price, D. and K. Sen. 2003. The Demand for Game-Day Attendance in College Football: An Analysis of the 1997 Division I-A Season. *Managerial and Decision*

Economics 24:35-46.

Rosentraub, Mark S., "Sports Facilities and Urban Redevelopment: Private and Public Benefits and a Prescription for a Healthier Future," Chapter 3 in *The Business of Sports*, Volume 3: Bridging Research and Practice, edited by Brad R. Humphreys and Dennis R. Howard, Praeger, Westport, CT, 2008.

Sports Business Journal. 2002. By the Numbers 2003. volume 5, number 36, December 30 pp. 91, 111.

Welki, Andrew M. and Thomas J. Zlatoper. 1994. US Professional Football: The Demand for Game-Day Attendance in 1991. *Managerial and Decision Economics* 15:489-495.

Welki, Andrew M. and Thomas J. Zlatoper. 1994. US Professional Football Game-Day Attendance. *Atlantic Economic Journal* 27(3):285-298.

Whitehead, J. C., S. K. Pattanayak, G. L. Van Houtven and B. R. Gelso. Forthcoming. Combining Revealed and Stated Preference Data to Estimate the Nonmarket Value of Ecological Services: An Assessment of the State of the Science. *Journal of Economic Surveys*.

Zygmont, Zenon X. and John C. Leadly, 2005. "When is the Honeymoon Over? Major League Baseball Attendance 1970-2000." *Journal of Sport Management* 19(3): 278-299.

Table 1. Dependent Variables

			Calgary Flames				Edmonton Oilers			
	Scenario		Attend = 1		Attend = 0		Attend = 1		Attend = 0	
Arena	Price (Flames, Oilers)	Finish	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Old	RP*	3, 5	5.19	7.85	0.00	0.00	3.84	4.42	0.00	0.00
Old	35, 45	1	7.08	11.86	0.27	0.80	5.76	9.10	0.57	2.85
Old	35, 45	5	5.62	10.53	0.13	0.66	4.87	10.42	0.23	0.91
Old	35, 45	3	5.95	10.31	0.19	0.70	4.97	7.86	0.32	0.97
New	20, 30	3	10.47	13.52	1.67	5.20	7.85	12.77	1.44	4.12
New	10, 20	3	13.30	15.59	2.68	7.34	9.48	13.54	2.10	5.57
New	30, 40	3	8.99	12.19	1.13	3.62	6.35	8.28	0.81	1.65
Cases			133		246		148		301	

*Revealed preference during 2006-07 season.

Table 2. Independent Variables

		Calgary Flames				Edmonton Oilers			
		Attend = 1		Attend = 0		Attend = 1		Attend = 0	
Variable	Description	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
RP-PRICE	actual ticket price	82.08	35.87	-	-	78.33	23.50	-	-
TRAVCOST	travel cost to downtown	26.36	67.45	43.75	65.76	39.47	57.68	59.87	83.35
INCOME	household income ($1000s)	110.86	35.23	77.30	36.99	93.78	38.09	70.57	39.30
MALE	1 if male	0.63	0.48	0.43	0.50	0.59	0.49	0.39	0.49
MARRIED	1 if married	0.73	0.45	0.65	0.48	0.72	0.45	0.71	0.45
AGE	age of respondent	42.83	13.66	50.15	15.25	43.28	14.49	51.68	16.46
EDUC	years of schooling	14.50	2.10	14.11	2.22	13.84	2.12	13.73	2.59
LIVE	1 if lives in downtown	0.08	0.26	0.06	0.24	0.02	0.14	0.05	0.22
WORK	1 if works in downtown	0.25	0.43	0.11	0.31	0.13	0.34	0.11	0.31
PROPERTY	1 if owns property in the area	0.69	0.46	0.50	0.50	0.56	0.50	0.48	0.50
TENURE	length of time at residence	19.95	16.09	17.18	17.40	20.31	17.91	21.24	21.57
ALBERTA	1 if Alberta survey	0.14	0.34	0.30	0.46	0.25	0.43	0.35	0.48
Cases		133		246		148		301	

Table 3. Random Effects Panel Data Poisson Model: Hockey Attendance Demand

	Calgary Flames		Edmonton Oilers	
	Coeff.	t-ratio	Coeff.	t-ratio
Constant	1.654	1.86	2.330	2.43
RP	-0.232	-8.52	-0.300	-9.53
RP-PRICE	0.027	5.68	0.032	4.99
SP-PRICE	-0.025	-25.72	-0.027	-19.07
TRAVCOST	-0.005	-3.13	-0.002	-0.94
NEWARENA	0.344	17.99	0.050	1.76
NEWARENA x ALBERTA	0.498	19.10	0.502	25.39
FINISH	-0.065	-8.99	-0.066	-8.84
INCOME	0.007	1.81	0.004	1.15
MALE	0.324	1.43	0.764	3.47
MARRIED	0.360	1.26	-0.654	-3.03
AGE	-0.032	-5.15	-0.033	-4.18
EDUC	-0.098	-1.59	-0.083	-1.59
GREEN	0.333	1.29	-0.047	-0.19
CASINO	-0.075	-0.21	0.740	1.94
HOUSING	0.576	1.62	-0.341	-1.00
ARTS	-0.384	-1.04	0.302	0.74
a	1.185	12.09	3.076	12.79
LL	-4338		-4532	
Cases	379		449	
Periods	7		7	

Table 4. Random Effects Panel Data Poisson Model: Hockey Game Attendance Demand (User vs. Nonuser)

	Calgary Flames				Edmonton Oilers			
	Attend = 1		Attend = 0		Attend = 1		Attend = 0	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Constant	4.153	4.38	0.990	0.46	3.335	3.69	3.363	1.79
RP	-0.177	-6.06			-0.214	-5.47		
RP-PRICE	0.002	0.66			0.005	1.03		
SP-PRICE	-0.020	-15.66	-0.044	-23.12	-0.020	-10.63	-0.046	-14.60
TRAVCOST	-0.004	-2.52	-0.001	-0.20	-0.001	-0.61	0.002	0.51
NEWARENA	0.237	9.80	1.943	28.86	0.004	0.13	0.718	9.41
NEWARENA x ALBERTA	0.341	11.35	-0.387	-3.16	0.420	19.14	0.663	7.68
FINISH	-0.058	-7.81	-0.241	-2.95	-0.043	-4.90	-0.386	-11.90
INCOME	0.001	0.26	0.006	0.89	0.007	2.26	-0.003	-0.62
MALE	0.051	0.26	0.069	0.14	0.334	1.63	0.404	1.09
MARRIED	0.230	0.82	0.415	0.73	-0.421	-1.86	-0.031	-0.06
AGE	-0.019	-2.32	-0.034	-2.26	-0.014	-1.81	-0.047	-3.23
EDUC	-0.083	-1.24	-0.001	-0.01	-0.079	-1.74	0.003	0.03
GREEN	0.271	1.16	0.261	0.37	-0.045	-0.17	-0.335	-0.71
CASINO	0.225	0.75	-0.082	-0.10	-0.024	-0.08	1.362	2.00
HOUSING	0.285	0.86	0.243	0.33	-0.172	-0.61	-0.075	-0.13
ARTS	-0.616	-1.90	-0.607	-0.74	0.347	1.17	0.876	1.29
α	1.185	5.93	5.591	7.57	0.914	7.89	4.731	7.88
LL	-2733		-1198		-2703		-1508	
Cases	133		246		148		301	
Periods	7		7		7		7	

Table 5. Consumer Surplus Estimates

	Calgary Flames				Edmonton Oilers			
	Attend = 1		Attend = 0		Attend = 1		Attend = 0	
Consumer Surplus per Game	CS/X	t-stat	CS/X	t-stat	CS/X	t-stat	CS/X	t-stat
Base Case	50.37	15.66	22.92	23.12	50.14	10.63	21.71	14.60
Change in CS per Game	ΔCS/X	t-stat	ΔCS/X	t-stat	ΔCS/X	t-stat	ΔCS/X	t-stat
With current arena	8.89	5.34			10.75	4.30		
With new arena for metro residents	11.92	6.14	44.52	14.84	0.22	0.13	15.59	5.84
With new arena for Alberta residents	29.10	8.37	35.66	10.29	21.30	6.07	29.98	7.58
Additional place in standings	2.95	6.38	5.52	2.85	2.14	5.18	8.37	8.89
With new arena and green design	13.65	1.17	5.97	0.37	-2.26	-0.17	-7.26	-0.71
With new arena and casino	11.35	0.75	-1.87	-0.10	-1.20	-0.08	29.58	1.95
With new arena and affordable housing	14.37	0.85	5.58	0.33	-8.62	-0.62	-1.63	-0.13
With new arena and cultural complex	-31.01	-1.87	-13.91	-0.74	17.41	1.18	19.02	1.29